U.S. Department of Energy's
Office of Science

Mini-Review of the Tevatron Run II Luminosity Upgrades

Closeout Report

September 8, 2004

Committee

- Daniel Lehman, Chair
- Stephen Meador, DOE SC-81
- Stuart Henderson, ORNL
- Flemming Pedersen, CERN (off-site review)
- Francesco Ruggiero, CERN (off-site review)
- Ron Lutha, DOE Fermi Site Office
- Michael Procario, DOE SC-20
- Aesook Byon-Wagner, DOE SC-20

Run II Luminosity Performance

- Impressive progress in Run II Luminosity Performance since February 2004 Review:
  - Peak luminosity: 0.6×10^{32} to 1.0×10^{32}
  - Exceeded “Design” Goal for FY04 by 12%
  - 18 pb^{-1}/week, almost doubled from FY03
  - Largely maintained high store hours/week (>100 hrs)
  - Recycler incorporated into operations via mixed-mode (“dual-source”)

Good Progress on the Technical Plan

- Slip-stacking ready-to-go
- Recycler ready-to-go, and already used in a new mode of operations
- Starting electron cooling installation after successful completion of cooling R&D
- Tevatron improvements: optics, alignment, BPM installation
- Good progress in responding to recommendations

Pbar Stacking Rate

- The high luminosity has resulted from a number of improvements to (and imaginative solutions in) the existing facility and its operations, but not yet from pbar stacking rate
- We see impressive improvements in instrumentation and understanding of performance limitations in pbar stacking rate since last review
- Look forward to your capitalizing on these improvements, and finding aperture restrictions to yield higher pbar stacking rates

Run II Luminosity Projections

- "Design" plan is aggressive but achievable
- More conservative ramp-up after shutdown is reasonable based on operating experience
- Look forward to seeing success of the next "Phase" of Run II operations

Recommendations

Antiproton Source:

1. Continue to provide study time for and priority to AP2 and Debuncher aperture studies
2. Continue to improve instrumentation to better understand performance limitations (scraper and beam loss scintillators in Debuncher and Accumulator for calibrated emittance measurements)
3. Continue to study and improve cooling systems and beam transport (equalizer improvements, gain optimizations, D to A line optics and aperture)

- Further recommendations may follow from off-site review

Recommendations

- Concerns about Tevatron operation at full Run-II intensities:
  - Strong-strong beam-beam interaction
  - Parasitic effects
  - Helix design

4. Devote some machine studies time to longer-term beam dynamics issues in the Tevatron
5. Continue to provide study time for pbar source, Booster limitations, …

Cost and Schedule

- Observations
  - As of July 2004, the Run II Upgrades are 38% complete
  - Monthly reports on cost and schedule status are being developed; Additional help has been obtained to implement the project control systems on the complex campaign
  - The committee encourages the laboratory to continue with reporting improvements (labor reporting across divisions)
- Recommendation
  - DOE-HEP, Site Office and Fermilab work together on making future improvements to the report as necessary

Management

- Lab management is giving appropriate priority to Run II activities
- Run II activities appear to be well coordinated across the lab
- Committee encourages the continued use of technical peer reviews
- The new luminosity projections appear reasonable